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The COVID-Digital-Home Assemblage: Transforming the Home into a Work Space during the Crisis

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Abstract

Major changes to home life and work practices globally have been brought about by the COVID-19 crisis. Periods of strict restrictions placed on people's movements outside their homes, aimed at curbing the spread of the novel coronavirus, have meant that the home was requisitioned as a primary site for work for many people. In this article, we draw on case studies from an ethnographic project that explored how people living in Sydney use digital technologies in the home setting. Our fieldwork commenced in early 2020, just prior to the national COVID lockdown period in Australia, and continued throughout the lockdown and the months following. As a result, we were able to document people's experiences of transitioning to working from home during the first year of the pandemic. In this article, we adopt a sociomaterial approach together with domestication theory to analyse the complexities of the changed COVID home in the context of digitised working arrangements. We document and theorise the tensions and leaky boundaries between workplaces and family/domestic life that are brought about by, through and beyond the digital. We illustrate two interrelated concepts of 'sociomaterial choreography' and 'spectral modalities'. These terms attempt to capture the processes through which the COVID-digital-home assemblage is continuously configured (sociomaterial choreography) and the more or less *simultaneous* presence and absence of people in both domestic and work domains (spectral modalities).

Keywords

COVID-19, digital technologies, work, domestic, assemblage, domestication, sociomaterial

Introduction

Since the emergence and spread around the world of the novel coronavirus SARS-CoV-2 in the early months of 2020, one of the major social impacts has been the mass shift to home-based working and learning arrangements in many countries worldwide. Broad restrictions on physical movement outside the home to curb the spread of the virus resulted in the closure of workplaces, shops, schools and campuses during extended lockdown periods. These changes transformed everyday routines and the domestic space for many people. The home was reconfigured and effectively requisitioned as a 'virtual' working and learning space almost overnight, requiring the widespread introduction of new (or newly) home-based technologies. Maalsen and Dowling (2020) characterise this development as 'the accelerating smart home'. More than a temporary shift, this marks a significant progression in the advancement of geographically disparate and digitally mediated working environments (Venkatesh, 2008; Dittes et al., 2019; Chesley, 2014; Mullan and Wajcman, 2019; Whiting and Symon, 2020; Collins et al., 2016), and for the expansion of the 'smartification' of the home.

The pre-COVID smart home is typically presented through a techno-utopian lens: as a suite of devices 'that provide some degree of digitally connected, automated, or enhanced services to building occupants' (Sovacool and Del Rio, 2020) and together operate to make everyday life more convenient, secure and efficient (Strengers and Nicholls, 2017; Maalsen, 2020). Since the introduction of technologies such as personal computing, the internet and Wi Fi last century, social research has also been conducted on people's experiences of what is often called 'telework' or 'telecommuting': or working from home using digital technologies. Conducted mostly from the perspective of organisation and employment research, this body of literature has identified a multitude of dimensions to whether telework is undertaken successfully, including gender, employer support and digital access issues, as well as the problem of 'presence bleed', or the experience of feeling as if one can never switch off from work while at home (Gregg, 2011; Felstead and Henseke, 2017). The predicted acceleration of 'flexible' working arrangements is now set to be a defining factor for smart home developments post-COVID, as the expansion of digital infrastructure in the home has been central to people adhering to 'stay at home' public health directives throughout the pandemic (Maalsen and Dowling, 2020). How people managed this acceleration and proliferation of technologies in their homes has been the focus of extensive academic and news media speculation (Hodder, 2020; Maalsen and Dowling, 2020).

It is still early days for empirical research to be published that can document people's lived experiences of COVID lockdowns and their aftermath. As prior ethnographic work has demonstrated, the realities of adapting to and living with technologies are often profoundly different from techno-utopian imaginaries (Nicholls and Strengers, 2019; Strengers et al., 2019; Hargreaves et al., 2018). Some autoethnographic reflections by academics (mostly women) on juggling caring for others and learning from home with working from home commitments during COVID have highlighted the difficulties and challenges involved from a gendered perspective (for example, Boncori, 2020; Clavijo, 2020; Abdellatif and Gatto, 2020). However, few of these accounts involve detailed analyses on the use of digital technologies at home during the first year of the COVID pandemic.

In this article, we discuss results from an ethnographic study [title removed for peer review] on the digitally embedded homes and lives of 30 people living in Sydney, Australia. We used video ethnography and arts-based methods to explore how people use and feel about various

devices which come under the umbrella of 'smart technologies': from smartphones, laptops, desktop computers and smart TVs to wearable self-trackers and home assistants. Our fieldwork commenced in February 2020, before the first lockdown restrictions were implemented in Sydney, and continued throughout the initial months of the COVID crisis until completed in September 2020. We were therefore able to investigate participants' technological transitions in their homes due to COVID-related closures. In what follows, we unpack the work of making the home a suitable digtal vector for the outside world in a period of upheaval and crisis. Building on the concept of the 'smart home as assemblage' (Maalsen, 2020), we discuss 'the COVID digital home assemblage' in the context of working and learning from home using digital technologies. We explore how households manage the domestication of new and/or newly home-based devices, and accompanying work practices, focusing on the sociomaterialities of their changeable domestic digital assemblages.

We begin by outlining our theoretical framework and then provide an overview of our project and methods. We then consider two key findings and offer a discussion in two parts. First, we engage with sociomaterial differences: namely the heightened and changed presence of digital technologies in people's homes during lockdown. Here we are witness to how people manage their modes of presence (and absence) through the sociomaterial configuration of their technologised domestic spaces and routines. Second, we engage with those empirical examples in which the dynamism of the COVID-digital-home assemblage is much more in evidence. Here the members of households negotiate domestic and work (and learning) spacings and timings: not least by drawing on the affordances of digital technologies, but also other material components of the home (such as furniture). Our conclusion addresses some of the implications and questions our research raises regarding digital home/work spaces and times, and on the value of taking a sociomaterial approach.

Conceptualising the COVID-digital-home assemblage

There is a considerable body of social research on technology and familial/household relationships. Much of this work has highlighted the processes of 'domestication' by which discrete and networked digital technologies become part of the home and everyday routines (Hirsch and Silverstone, 2003; Spigel, 2001; Lally, 2020; Berker et al., 2006; Morley, 2003; Goulden, 2019). At the centre is Silverstone et al's (1992) articulation of the four phases of domestication: appropriation, objectification, incorproration and conversion. Approaching the household as a moral economy, these scholars trace lines of ownership, usage and display – the complex ways that domestic things become active parts of spaces, relationships, routines, identities and social worlds. The four phases capture the various processes by which technological objects and media form part of a household's continuing efforts to become a *home* (Silverstone et al., 1992: 17). By focusing on the contexts and meanings of people's technological practices, this conceptual grounding helps orient us towards questions of mediation and negotiation (Hirsch and Silverstone, 2003; Lally, 2020; Spigel, 2001; Maalsen and Dowling, 2020): between household members, areas and other objects of the home, times of each day and weekly routines, and between private and public life. These questions are especially relevant in the COVID pandemic context as the boundaries between the domestic and the 'outside world' are collapsed and blurred.

Recent ethnographic research has identified the role played by digital technologies in configuring the 'mundane intimacy' of the home (Hjorth et al., 2018; Leszczynski, 2019; Pink et al., 2018). These processes are neither uniform nor given, and within this body of work some researchers focus their attention on unearthing the hidden labour required of

domestication. For example, Tolmie and colleagues (2010) deploy the metaphor of 'plumbing' to stress the diverse material conditions of people's existing homes which technology designers must take into account: that is, 'the actual work of installing digital technologies in a setting' (Tolmie et al., 2010: 181). Through an ethnography of the installation of an equator component toolkit in a research team member's home in the United Kingdom, these scholars critically engage with the notion of the invisible work of setting up home computing systems. They highlight the technical and practical labour and expertise required for home-based technologies to become meaningfully and materially domesticated. In more recent work, Kennedy and colleagues (2015) highlight the gendered distributions of labour and expertise in digital housekeeping and housework. Drawing on a study of 22 households across Victoria, Australia, the authors consider the immaterial labours and uneven, gendered clusters of expertise required for effective and ongoing domestic digital technology use.

Such research emphasises the *co-constitution* of home, gender, familial relationships and digital technologies as part of sociomaterial practices of domestication. In other scholarship Sørensen (2006) has drawn on actor-network theory to consider the relational dynamics of domestication. In so doing, he usefully extends the theory beyond a 'moral economy of the household' focus in his analysis of an electric car and the mobile phone (2006: 46-47). From this theoretical perspective, he argues, 'Domestication implies not only the *movement* of objects in a network, but also a series of *joint enactments* between human and non-human elements' (Sørensen, 2006: 48, emphasis added). In more recent work, on Norwegian local government websites, Liste and Sørensen (2015) extend this thinking to consider how sociomaterial assemblages result from processes of domestication. The sociomaterial concept of the assemblage is crucial in this scholarship: understood as a gathering of humans and nonhumans in which agencies and capacities for action are dynamically generated relationally (see DeLanda, 2019; Deleuze and Guattari, 1988). This concept is integral for how we conceptualise the homes and lives of our participants during the pandemic. Distinct from exploring the relationships between discrete things, we make use of assemblage theory in line with other sociomaterial approaches to centre relationality, action and processes *in situ* (Davies and Riach, 2018; Fenwick, 2016).

In attempting to theorise our participants' domestication of 'smart' technologies in the home during the COVID crisis, we also draw on Richardson's (2011) work on mobile media and location-based gaming. Richardson explores the relationships between corporeality and spatiality afforded by mobile games following the introduction of the iPhone. While such leisure practices fall outside our primary focus in this article, she usefully summarises mobile movement plus the compositions of gameplay as 'choreographies' (Richardson, 2011: 423). Richardson also draws attention to the dichotomy of actual versus virtual in a way that is highly relevant for our work. In arguing that mobile gaming disrupts this actual-virtual dichotomy and instead offers a hybrid ontology, she conceptualises 'modalities of presence' (Richardson, 2011: 426): how actual and virtual 'containment attributes' of devices and practices are 'actively negotiated on-the-move' (Richardson, 2011: 428). If the notion of sociomaterial choreography can aid in grasping the shifting COVID-digital-home assemblage, a version of 'modalities of presence' can further nuance our understanding, especially of the simultaneity of presence and absence in the home and at work. We take up a sociomaterial approach towards relational processes of technological domestication to analyse the COVID-digital-home assemblages of our participants, focusing in particular on the kinds and qualities of *change* characterising their digitised homes and lives during the pandemic.

Fieldwork

Our research took us into the homes of 30 different people living across the greater Sydney area, some face-to-face and the vast majority via digital video-call. In designing the home visit fieldwork, we were inspired by previous studies using video ethnographies to document Australians' everyday experiences with digital technologies in home settings. In this work, researchers have moved around people's homes with them, video recording the domestic space, objects within the space and practices of use as demonstrated or re-enacted by participants, and talking about these objects and practices to gain further insights into their technology use. These studies have explored Australians' household practices such as their use of broadband technologies (Kennedy and Arnold, 2020; Kennedy et al., 2015), smart home devices (Strengers and Nicholls, 2018; Kennedy and Arnold, 2020) and locative technologies (Hjorth et al., 2018). Our use of hand-drawn maps built on previous uses of this method in cultural geography (Donnelly et al., 2020).

We visited each participant once and spent between 1 to 1.5 hours on average talking with them about their digital technologies and their personal data. Before COVID restrictions were implemented by the Australian government, two members of the research team would visit a participant's house in person to collectively tour the rooms and discuss the digital devices therein, using a handheld camcorder to capture the visit. Movement restrictions came into effect early in the project and so, wishing to continue our research during this digitally significant period of social change, we carried out our home visits virtually. We had already received ethics approval for the project from [university name removed], and a modification to use virtual methods was approved by the ethics committee.

For virtual home visits, [first author] video-called participants via Zoom. Having joined the call on a portable device (usually a smartphone), participants then led a home tour that showed the researcher where their devices typically lived and travelled while responding to [first author's] questions. In all home visits, participants also took part in map making activities. These involved participants using a pen and paper to sketch maps of the digital devices in their homes, including how these technologies connected with each other and personal information generated with and through the devices. The entire video-call was recorded for documentation and analysis purposes. Following each home visit, [first author] created a detailed case study for each participant that included ethnographic fieldnotes, partial transcriptions, selected screenshots from the video recordings and photographs of maps drawn by the participants. Working with our sociomaterial approach, we then reviewed each case study aiming to surface the complexities of our participants' productive entanglements with digital devices and other human and non-human things. Guided by Jackson and Mazzei's (2012) analytic method of 'thinking with theory', and the question of how new or newly home-based digital technologies were becoming part of and reconfiguring the household during this period, our analysis concentrated on identifying how our participants' accounts and the visual materials gathered revealed the ways in which work *and* domestic space and time were enacted: the multiple people, rooms, routines, and things (digital and otherwise) that make up people's homes as a COVID-digital-home assemblage.

Our in-person and virtual home visits focused on the same topics of discussion: namely people's individual and collective digital technology use within their homes and in their everyday routines, and their understandings and feelings about the use and value of their personal data. However, understandably, the home visits conducted during the early months

of COVID lockdown focused heavily on the sudden and significant pandemic-related changes people were facing in their everyday lives, as digital technologies formed a large part of this change. Here, we focus on the experiences of nine of our participants. These participants were all predominantly working from home at the time that we spoke, and each home visit occurred in the virtual mode via Zoom. While the technological mediation of work and home was an interesting point of discussion for most of our participants, including those we spoke to pre-lockdown, our aim in focusing on key cases is to consider the various ways in which private domestic environments have and will continue to be technologically reconfigured as a – or *the* – site for work. The social contexts of the COVID crisis which shape how our participants experienced this time as a crisis offer important insight into emerging configurations and issues.

Sociomaterial differences

While digital devices already formed part of the fabric of our participants' homes, the heightened presence of digital devices due to the impacts of COVID-19 was a key issue our participants discussed during the home visits. Many noted that they had more technology in their homes, or more devices in active use. All our participants discussed spending more time using their digital devices during the period of lockdown. Chris, 28 years old, lives in inner city Sydney with his partner and a housemate. He noted that there was an increased material presence of technologies in his home because of work-related requirements. Figure 1 shows the makeshift set up which the household members organised in order to work from home, with computer monitors and other necessary technological tools such as high-quality microphones borrowed from each of their workplaces.

Figure 1: Chris' home office and office map
ABOUT HERE

Achieving a practical level of functionality with the space and devices took considerable knowledge and skills. Chris explained that, due to limited workspaces in the rest of the home and the limitations of their internet bandwidth, the devices are connected via ethernet cables – a system which one of Chris' housemates, a skilled IT professional, organised. Chris notably simplified this complexity in the above map he drew of the space, the minimalism of which reflects the ease with which they now work together from home. Here, technical and intellectual capital was required to set up and operate such a demarcated work space in the home: socio-material choreography was, in a sense, 'settled'.

Maya, aged 23, who lives in inner city Sydney with her parents and siblings, also usually worked in an office environment and shared this experience. Similar to Chris, she had assembled a makeshift work desk using extra workplace monitors and laptops in guest room in her family home. Despite this clearly increased material presence, Maya was one participant more familiar with having work-related devices or device uses actively present in her domestic, familial and social spaces. As the ethnographic fieldnotes detail:

> She checks her work emails on her smartphone all the time, she says, and likes being able to do so – it doesn't seem to make her feel like she's 'always at work', I gather from her tone, as some other participants have variably reflected on; she tells me how she notes what emails need responding to when, and does so in her worktime as required. (fieldnotes)

Maya's virtual home visit highlights the temporal and material ways in which work-related technological devices become (and already are) mundanely enmeshed in the everyday. To the extent that work and the domestic are co-present, this is low-key. Maya is at-work-at-home, but she makes no mention of feeling absent from home (feeling always at work). We might speculate that this derives in part from her use of the smartphone which affords a degree of 'discreetness' that the use of a laptop would not necessarily achieve (and to that extent, she is likely to be perceived by her parents and siblings as domestically 'absent').

Holly's experience was markedly different from that of Maya. Holly, aged 27, lives in Sydney's inner city with a housemate. She talked at some length about struggling to work remotely during lockdown. Living in a small shared apartment and used to living a very active social and work life, Holly spoke about feeling and being unproductive at home now that she was limited to her small apartment and expected to be on her laptop for work 'all day everyday' (video transcript). She explained,

> I'm terrible at it. I'm pretending really, really well, I think. There's just so many other things I'd rather do at home, like washing or cooking or cleaning or walking or literally anything. I'm finding the motivation and focus on work really, really hard… it seems that I can't be in two things at once... I need that separate space. And even though that we've set up in the living room, in the dining room and, you know, we've got screens and it's very work-y and we've got books and whatever, it just – I'm just distracted by anything, you know, whether a fly goes past me I'm like 'ooh fly', like, 'what else can I do besides this?' And the same with yoga. It's not been great. (video transcript)

As the fieldnotes capture from the tour Holly gave of her apartment spaces:

> She showed me her dining table where she tries to work, near the kitchen in the shared part of the house; she also showed me where she often 'really' works, keeping her laptop charging beside her bed overnight, so at 9 am she can roll over and reach it off the ground, and log in online on time, staying in bed if she wants, or working at the small desk in her room, venturing out to the kitchen when she is eventually hungry. (fieldnotes)

The material and affective tensions experienced by Holly no doubt stem in part from her pre-COVID work as a real estate agent intensively engaged in face-to-face and *in situ* interactions which involved a significant amount of local travel. Home as a non-work space constantly threatens to overwhelm its configuration as a work space. One way of dealing with this seems to be to render the 'units' of home and work smaller and smaller, so that, for instance, work enters the bedroom at a specific time. Here sociomaterial choreography seems liable to flip to the domestic, and this needs to be repaired by such practices as having a laptop to hand in specific times and places in order to perform work presence. Being present at home is the default and needs to be routinely and micro-socio-materially resisted.

Declan, aged 26, who lives in eastern Sydney with his partner, similarly experienced a major transition through remote working. While he did not discuss struggling in the same way, or affective shifts to the same intense degree as Holly, Declan did speak about the dramatic change in work practices. His 'typical' pre-pandemic busy and social workdays involved significant local and interstate travel, whereas he now worked online all day while home alone. He described being 'pretty much stuck on [his devices] now for work and social

reasons' (video transcript). Declan's 'screen time' significantly increased as he was spending more time on the computer and because he was keeping the TV on throughout the day (for company) while his partner continued working outside their home in essential services. Declan's case marks an interesting contrast to Holly's. Whereas Holly needed to resist the domestic, Declan invites it into the work routine by having the TV on for company. Where for Holly a socio-material choreography in which the domestic blurred into work was disruptive, for Declan it was useful. Whereas Holly struggled to be both at home and at work, for Declan this was doable.

Tracy, 41 years old, lives in South Sydney with her husband. She noted that the recent changes in presence in her home were both technological and person-related. Like the other participants, Tracy was not used to working from home, and she was having to do so at least part of the time while furloughed from her usual workplace (an airline) into essential services (grocery delivery). She also did not add to the devices she already had at home. She was using her existing home computer, tablet and smartphone for work and did not need anything additional to this. The main change for Tracy was that she was computer-based *at home*. Unlike others, she was not necessarily spending more time on the computer in her new role or for the work she was required to do from home, compared to her pre-COVID employment, but was using her personal devices and personal space for work. Significantly for Tracy, she did have additional caring responsibilities during lockdown. Tracy took on caring for her primary-school aged niece for several days during the week, as her niece's parents were frontline workers unable to conduct their employment from home, and schools in the area were closed.

There are similarities between Declan and Tracy in that both seem to manage the interdigitation of work and domestic life. In Tracy's case, this seems to reflect the use of particular familiar digital devices and spaces that signify the domestic while being 'at' work (which itself has not proliferated). Even the presence of her niece did not detract from this comparatively smooth choreography. As we shall see, this was certainly not the case for other research participants whose COVID-digital-home assemblage required considerable effort.

Sociomaterial choreographies

In this section, we address empirical examples where COVID-digital-home assemblage proves both more dynamic and more challenging. As we shall see, the affordances of digital technologies, along with those of other domestic objects, are central to the sociomaterial choreography of domestic and work (and learning) spacings and timings.

For a number of other participants, the main difficulty they faced in working from home during the COVID lockdown was sharing space with other members of their household. This was the case for Lucas, aged 41, who lives in western Sydney with his wife and their baby. He and his wife continued to work remotely and required childcare services so that they could meet the requirements of their employment. While Lucas stressed enjoying the increased time that he was able to spend with his family because of the lockdown circumstances, the same conditions means childcare for Lucas and his wife was 'a necessity'. In this case we can note how the socio-material choreography of the COVID-digital-home assemblage required an additional element: namely childcare services. This highlights the ways that COVID-digital-home assemblages reach beyond the home in complicated ways, not least in relation to childcare: households might draw on or, as in Tracy's case, become sites, of 'supplementary' childcare.

For Taro, the material conditions of working from home with young children were also particularly intrusive. Taro, 39, lives in inner city Sydney with his wife and two young children. Taro's wife cares for their children during his work hours. As the family live in a small apartment, when the children wanted to play in their bedroom, Taro set up his laptop at the dining table. When the children moved to the family room downstairs however, Taro sometimes worked outside in their small backyard (weather and Wi-Fi connection permitting) or upstairs in his bedroom, sitting on the edge of his bed while resting his laptop on their clothes dresser, where the baby's nappy changing mat is usually positioned (see Figure 2). 'It's a change table now, but I convert it to office space,' he explained (video transcript).

Figure 2. Taro's upstairs workspace, on a dresser in his bedroom, where the baby's nappy changing mat is usually positioned, as pictured.
ABOUT HERE

There are patterns of collective movements in Taro's house, both of his family members and of their different digital devices, which accord with the children's daily and his own work routines. His work devices in particular are packed away at the end of each day. As Taro explained, 'I don't mind, but my wife [laughs]), she likes to be organised, so she doesn't want to see laptops. She hates laptops, so I have to pack up and yeah, so, I make it, keep it minimum pretty much… I always put it [the work-related devices] in a cube once it's done' (video transcript). In this instance, we note again the complexity of the sociomaterial choreography of the COVID-digital-home assemblage. Taro must move around the house, or pack away his laptop, in order to ensure the domestic space. This is possible in part because of the affordances of his laptop: hated by his wife as it is, it nevertheless is small enough to be movable and hide-able. Relatedly, Taro's spectral modality is one in which he moves around the house in order to absent himself from the domestic, even as he is highly sensitised to the demands of the domestic.

Will, 31 years old, lives in North Sydney with his wife and baby. He also had a necessarily mobile workspace to manage the at-home workday during COVID restrictions in his small two-bedroom apartment. The room in which Will typically works, with a necessarily complex technological set up of multiple large computer screens and telecommunication devices, is also his infant daughter's bedroom. Only a few months old, his daughter is cared for full-time by Will's wife while he works and is regularly put down to sleep in her bedroom throughout the day. The room is quite literally split down the middle in style and function. One half holds the cot, dresser and change table, and three decorative pictures of baby animals on the wall (an elephant, a tiger, a giraffe); the other half contains Will's work desk and ergonomic chair, his desktop computer and laptop, a smart assistant device, his Bluetooth headset, and all the other non-digital materials of his office.

Like Taro, Will moves in and out of this space in relation to his child's and partner's needs; negotiating this relationship is a material part of his employment while working from home. This was mirrored in our virtual home visit. Will's baby had just been woken from her morning sleep and taken into the loungeroom at the start of our virtual home visit, and Will remained in this office/bedroom during the entirety of our visit so as not to disturb his family; he had brought all of his mobile devices from across the house into the office to show and discuss, and took extra detail explaining where they usually live in the mapping exercise in lieu of touring the main apartment living space. In spite of the relatively immobile nature of his 'main' workspace, as with Taro, Will draws on the affordances of his mobile devices to

move around the house as the domestic space itself reconfigures with the baby's needs. This particular example also throws into relief the 'social affordances' of people. A child's developmental stage also contributes to sociomaterial choreographies, as we also see in the next case.

The blurring of home and work spaces – and time – was significant in Sue's case. Sue, aged 51, lives in eastern Sydney with her husband and two high-school-aged children. She spoke about a temporally significant presence which her digital devices afforded while she worked from home using a laptop at her dining room table. Due to the built-in functions of the digital co-working platform her employer had established for team use during the lockdown, Sue was able to engage and stay in active communication with her colleagues via messaging avenues and live team meetings. Important also were the more minor technical functions of the platform and her own devices. Sue was able to participate in team meetings, listening using her headphones so to not disturb her partner or teenaged children who were also working and studying in the house, and muting her own microphone wherever possible so any noise from her home environment did not disrupt the digital work environment.

Over and above lessening the distractions to work for home, and vice versa, these technological affordances enabled a spectral modality in which Sue could be *multiply present*, juggling the demands of a simultaneous work and home life. While showing this space to us (see Figure 3), pointing out her typical laptop setup at the dining room table, Sue shared a vivid anecdote:

> So I've been working from the dining room table during the day, during COVID, um, and this is our dining room in here, and that's the table, so you can see it with the laundry hanging around [laughs], that's the laptop, the work laptop, and, um, my phone typically sits here while I'm working… This morning I had a meeting that I had to join, and my son was still having breakfast at the table opposite me, um, so, what I guess I'm trying to say about that is that it's a fairly communal, like, I could still carry on with the meeting and they had no idea that he's sitting there having breakfast with me, just because of the way the laptop was positioned and the sound etcetera turned off (video transcript).

Figure 3: Sue's current work from home set up at her dining table ABOUT HERE

In the pictured space with its various devices, Sue demonstrates her presence and contribution to the workplace via the performative functions of the digital work platform. She explained that establishing such a productive space was important, considering the very real possibility of being made redundant, while also allowing her to be present in the home, caring for her family during a time of crisis and supporting them through their own challenges of working and learning from home. As Figure 3 shows, it is significant that Sue's workspace is in the communal 'heart' of their home, surrounded by the family's washing and with a direct eyeline to the TV where her son plays videogames, where she can be (and perform) presence and accessibility for her family. While she works downstairs in this open area, readily accessible to the family and susceptible to their movement and noise, Sue's children do their required school work upstairs in their own bedrooms, and her husband works from their bedroom at a small desk. Each morning he slides open the wardrobe to the desk's left and the room transforms into a temporary office. His paperwork, a laptop, extra monitors and a printer are easily accessible from within the cupboard, and the personal desktop computer,

which of a night-time they often stream TV on together from bed, become his primary work computer.

Sue's example raises another issue for our analysis: while the COVID-digital-home assemblage is sociomaterially choreographed across the members (and space-times) of the household, it is nevertheless 'perspectival' and interembodied. By this we mean that Sue, her children and her husband might co-ordinate their activities, but we can imagine that there will also be differences as their respective embodied/virtual modalities come into tension. Domestic demands by the children, for instance, might require a shift in Sue's own modality so that she becomes more 'present' in the domestic than in the work space. While the technical affordances (muting, making tactical use of the camera's field of vision, switching the camera off) might disguise or diffuse this shift, there might still be moments where the blurring of home and work spaces – and an embodied/virtual modality that balances absence and presence – is no longer feasible. A deliberate commitment to 'presence' in one space or the other is necessary.

Discussion and concluding remarks

Our home visits occurred during the early months of the COVID crisis, a period of mass social upheaval. In this article, we have considered one dimension of this upheaval: namely the increased centrality of work in the home under lockdown restrictions conditions. As such, we have attempted to the chart several of the ways in which households have attempted to manage this change. What is noteworthy about the contemporary situation is that digital technologies that have become domesticated, along with domestic spaces that have long been familiar, have become respectively de-domesticated and de-familiarised. The impact of COVID is that the digital technologies become associated with different meanings and practices centred around routines of work. The previously settled digital-home assemblage now becomes the unsettled COVID-digital-home assemblage that needs to 'domesticated' anew. Moreover, 'domesticated' now needs to be understood in terms of its double meaning of, on the one hand, 'familiar' and, on the other, 'non-work' – the space/time of home and family life. That is to say, the technologies, spaces and routines of work must be made to work amongst and across the technologies, spaces and routines of home.

Building on our findings, we can develop the notions of 'choreographies of digital practice' (Richardson, 2011) and 'modalities of presence' (Caron and Caronia, 2001) further. Here, we assume a sociomaterial choreography characterised by technological-practical-spatial-and-temporal coordination and patterning in which the sociomaterial affordances of technology work with the practices of domestic life to structure the tempo and spaces of worklife/homelife. Moreover, within science and technology studies, choreography attains another quality. As famously discussed by Cussins (1998) in her analysis of ontological choreography, women in medical settings complexly enact themselves as both subjects and objects. Similarly, in Michael's (2015) account of epistemic choreography, knowledge and non-knowledge closely interdigitate in the process of conducting social scientific research. In both cases there is a topological layering of divergent elements: subjecthood turns out to be very close to objecthood and vice versa, knowledge becomes ignorance and vice versa. This quality of choreography seems especially apt for our fieldwork in which as the COVID-digital-home assemblage unfolds, the spaces and times of work and home constantly flip into one another, and, indeed, can co-exist in sometimes uneasy ways.

In so doing, our sociomaterial approach considers the *relational and embodied vitality* of materiality. We have attended to how the non-digital is equally constitutive of the domestic as the digital, which is significant for making sense of the tensions of/with encroaching workplace technologies during the period of the COVID crisis. In particular, the configuration of relationships between technologies, domestic objects and settings and their respective affordances, affect the sorts of social relations that can be enacted. At the very least, they impact on the presence or absence of members of the household to one another (and to work colleagues too). Or rather, these configurations enable people's simultaneous presence and absence. We propose the term 'spectral modalities' to get at this idea of embodied/virtuality, bringing together and extending the concept of choreographies of practice and modalities of presence. Just as spectres are present but somehow absent, being preoccupied with a different space-time, or are in a different space-time and sometimes unexpectedly attend to the present moment, so too are housemates and family members present but preoccupied 'elsewhere', but can then become suddenly present. Such spectral modalities, we suggest, are partly facilitated by the affordance of digital technologies and other domestic objects and settings as they come together with the affordances of human bodies. They encapsulate human bodies' ability to be simultaneously absent and present in space, to constantly shift between online and in-person encounters and interactions, to dance around each other as devices and digitised conversations configure in and out of assemblages with home furniture and housemates or family members.

As our participants' responses suggest the emergent COVID-digital-home assemblage has been subject to an ongoing process of sociomaterial choreography. This is characterised by spectral modalities in which participants interweave their presence and their absence in relation to the spaces of home and work, to colleagues, and family and friends. In all this, the affordances of digital technologies are crucial, but so too are the ways in which these technologies are situated amongst 'mundane' domestic objects (cupboards, changing mats, dining tables) and embodied practices (babies' naps and nappy changes, children's meals and schoolwork). In any case, far from the techno-utopian visions of the virtual home-based workplace or learning space that are often part of the COVID smart home imaginary (Maalsen, 2020), the COVID-digital-home assemblage turns out to be messy, complicated and in need of on-going patterning as household members choreographed their work and domestic space/times.

Each of our participants were navigating technological, employment-related and familial issues during the period of our fieldwork. The relational, temporal and sociomaterial complexities of these issues raise important questions regarding how our participants were able to 'make do' during lockdown, and what mattered for them in their new COVID-digital-home assemblage. Throughout, we have seen how care was a central concern: care for children, care for domestic tasks, care for work, care for self. These issues of care were intensified by the COVID crisis, brought to the surface in various households and ways as lockdown conditions fluctuated. Our findings point to the significance and requirement of having domestic space(s) suitable for work, as well as spaces that are, or can be, 'just home'. The examples of Taro working at change table and packing away all work things from view at 5pm, and of Will being able to work in the bedroom/office *and* vacate that space for his baby's sleeping requirements both indicate how such practices of care for others lies at the heart of the sorts of sociomaterial choreographies and spectral modalities we have documented.

It is important to emphasise that these transitions to digitised remote work highlight relational burdens of presence and absence, attention and care: of being able to get work done and 'be' (seen) at work while at home. The tensions and leaky boundaries between workplaces and family/domestic life – people's spectral modalities – require constant practical and emotional work and improvisation, as well as the cooperation of other home occupants. This labour is intensified for our female participants with dependents, who balanced familial management and caring responsibilities at home while 'at work'. For Tracy, this involved multihousehold relationships to support work and care at her own and relations homes; for Sue, this involved supporting her husband and children to work (and learn) from home. Put bluntly, if the COVID-digital-home assemblage is perspectival, perspectives are gendered and female members of households must work much harder at sociomaterially choreographing that assemblage.

We are well aware that in our analysis here presented we have only scratched the surface. Even if our proposed analytic concepts of sociomaterial choreography and spectral modalities are of some use in illuminating the extraordinary circumstances in which people find themselves at home, there is much that remains to be investigated. For example, we have barely addressed the inequalities entailed in the transition of domestic to work spaces: some people are burdened with much greater home work demands than others. Relatedly, how do we account for the constraints imposed on COVID-digital-home assemblage imposed by such factors as the expense of housing, inadequate access to digital devices or Wi Fi or the cost of familial care for those on low incomes? Moreover, as we have become collectively more familiar with the exigencies of digital home-working, we have become aware of the many other ways in which technological affordances can feed into the processes sociomaterial choreography and spectral modalities. For example, functions such as digitally blurring backgrounds for video meetings can at once delineate greater work-orientation but also serve as reminders of the unseen – suspiciously hidden? – domestic space. Other housemates might be allowed to enter into view during work meetings as a signifiers of the difficulties of home-working and one's commitment to work.

Taken together, the above remarks suggest a number of avenues of further of research. On the one hand, we need to explore how the range and import of 'wider' processes (for example, the costs of housing and digital access; inequalities of work demands) manifest concretely within the COVID-digital-home assemblage. On the other, we need to delve more deeply into the range of 'local' affordances that serve in the ongoing unfolding of the COVID-digital-home assemblage.

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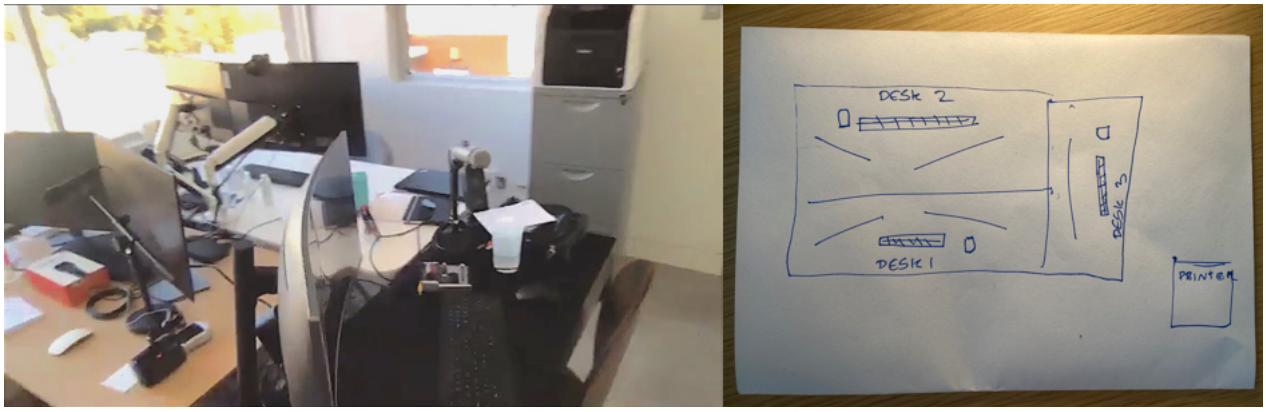

Figure 1: Chris' home office and office map

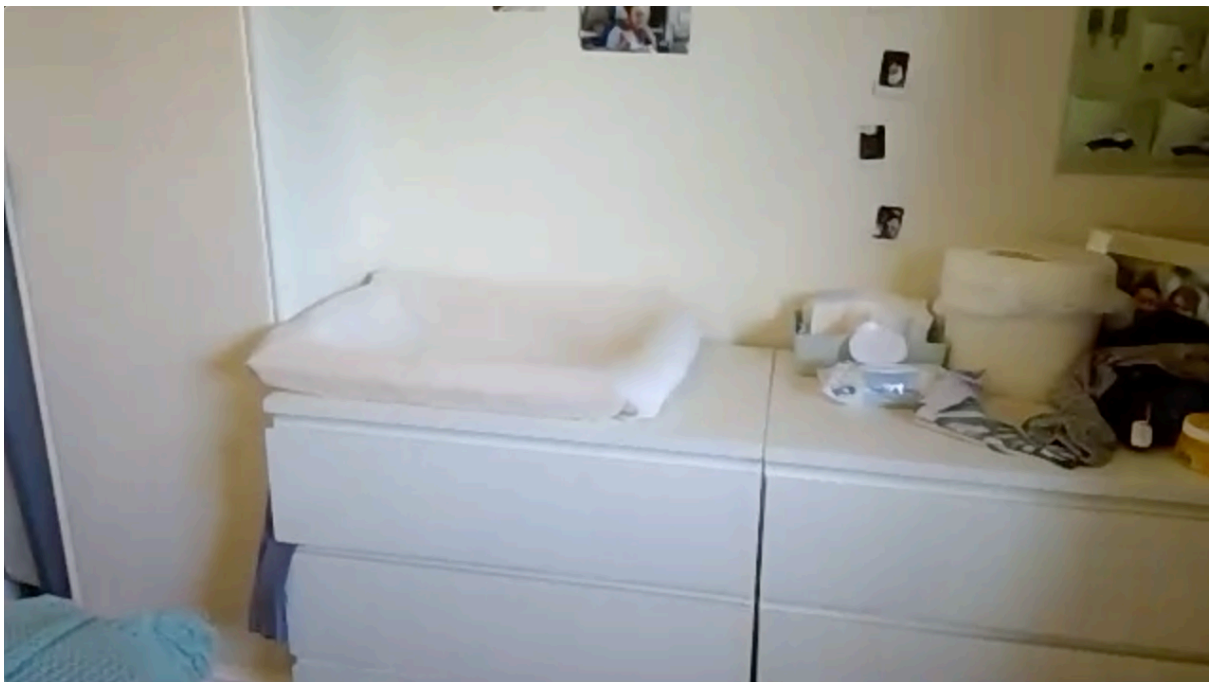

Figure 2. Taro's upstairs workspace, on a dresser in his bedroom, where the baby's nappy changing mat is usually positioned, as pictured.

Figure 3: Sue's current work from home set up at her dining table